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SOLAR/1043-79/06

Monthly Performance Report

HULLCO CONSTRUCTION

JUNE 1979

FEB 14 1980

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

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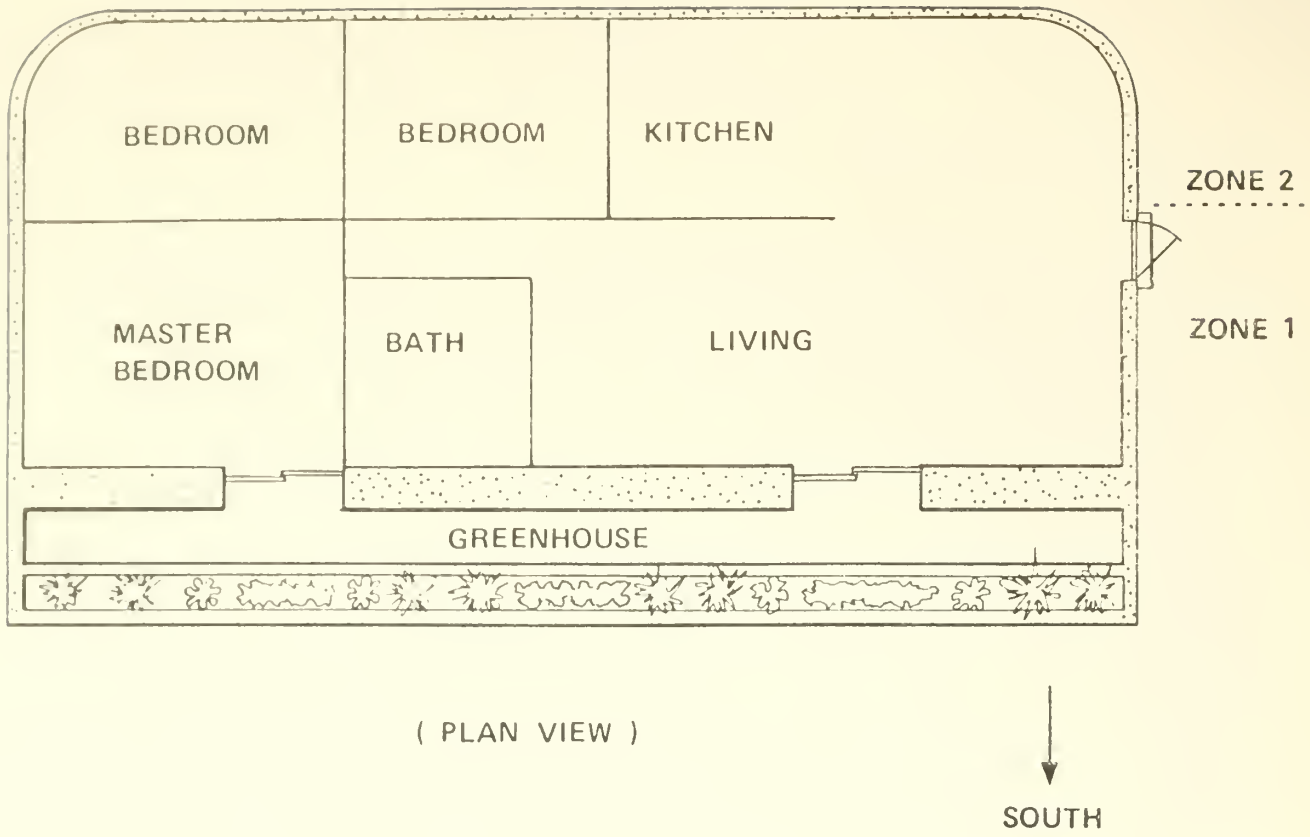
MONTHLY PERFORMANCE REPORT
HULLCO CONSTRUCTION
JUNE 1979

I. SYSTEM DESCRIPTION

The Hullco Construction solar energy system is a passive space heating system for a single family residence located in Prescott, Arizona. The south-facing building, illustrated in the drawings of Figure 1, is a combination greenhouse and direct gain passive system. Incident solar energy enters the building through approximately 400 square feet of double-glazed prefabricated Kalwall panels. Two sliding glass doors between the greenhouse and the house along with a window in the bathroom admit incident solar energy directly into the master bedroom, living room and bath areas of the house. Collected solar energy not used to satisfy the immediate building space heating demand is stored directly in the massive walls and floors of the building or indirectly in the 670 cubic feet of three to five inch diameter rock storage which is located under the floor of the north half of the building. Stored energy is released by low temperature radiation to satisfy the building space heating demand during periods of time when incident solar energy is not available.

Direct storage of collected solar energy is provided by the walls and floor of the building. The brick floor and the black painted north wall of the greenhouse provide solar energy storage for the greenhouse. The 12-inch thick, sand-filled concrete block greenhouse north wall acts as a Trombe wall, storing collected energy from the greenhouse during the day, and releasing the collected energy by radiation to the south part of the building at night. The 4-inch thick building concrete slab floor acts as direct solar storage, particularly in the living room and master bedroom areas where the floor is covered with Mexican tile masonry. Additional storage is provided by the 8-inch thick solid grouted concrete exterior insulated building walls on the north, east, and west perimeter of the building.



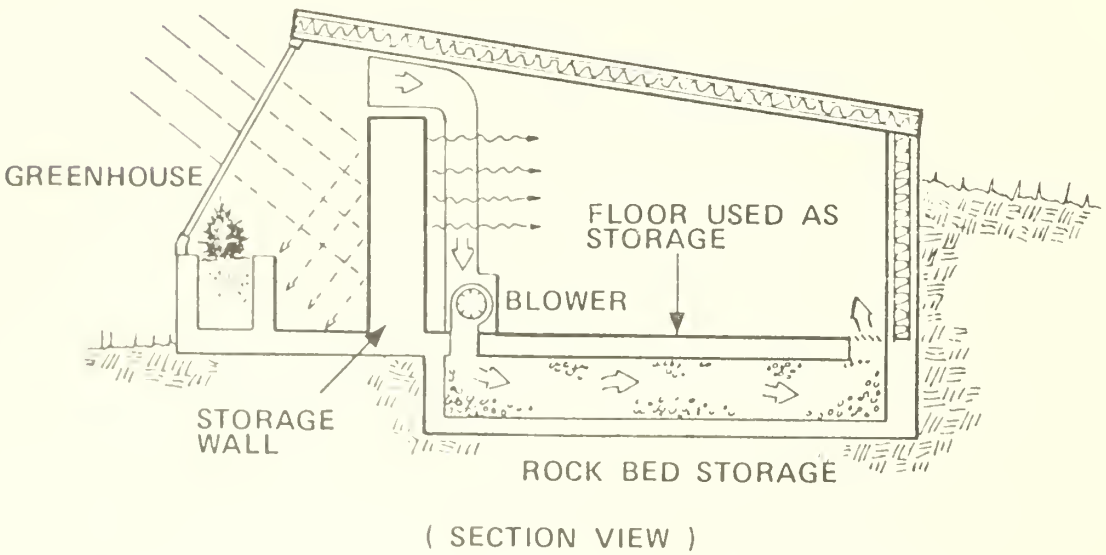


Figure 1. HULLCO CONSTRUCTION COMPANY SOLAR ENERGY SYSTEM SCHEMATIC

Indirect storage of collected solar energy is provided by the 670 cubic feet of rock storage located under the north side of the building and by the 4-inch thick carpeted concrete slab floor poured on top of the rock. Solar energy collected in the greenhouse is transferred to the rock bed from vents at the end of the greenhouse through under-floor ducts by two one-third horsepower blowers located at the east and west ends of the greenhouse. After transferring energy to the rocks, the air returns to the greenhouse through the house from floor vents located at the north side of the building. The greenhouse fans operate when temperatures near the top of the greenhouse reach approximately 90°F. Energy stored in the rock is released through the carpeted concrete floor to the house.

Summer overheating protection is provided by venting of the greenhouse and by both natural and artificial shading of the greenhouse glazing. Natural shading of the greenhouse is accomplished by the use of an existing tree to the southeast of the structure. However, the tree, a juniper tree, does shade the greenhouse some during mornings even during heating season. Additional greenhouse shading can be provided by a redwood snow fence placed over the glazing. Draperies covering the sliding glass doors on the north wall of the greenhouse can be closed to prevent incident sunlight from entering the building. Nighttime venting of the building can be used to cool the energy storage masses, thus cooling the building during the day as energy generated inside the building is absorbed by the walls and floor. Daytime venting of the greenhouse is accomplished using a thermostatically controlled powered fan, located at the top of the greenhouse, to draw air through the house and out the top of the greenhouse.

Low building heating loads are maintained by the use of good energy conservation construction techniques. The north, east, and west walls are insulated on the outside of the concrete blocks with two inches of styrafoam with a total wall R-value of 11. Nine inches of fiberglass batt insulation is used in the roof to yield a roof R-value of 32. The entire perimeter of the concrete slab floor is insulated. A minimum of

window area is used on the north, east and west walls. The building is bermed four feet into the earth on the north and west sides.

Auxiliary energy for space heating can be supplied by either electric radiant heat panels, or by the wood-burning stove. The wood-burning stove uses outside combustion air. The ceiling-mounted electric radiant heat panels, located in each room, are controlled by individual room thermostats.

The predicted annual solar contribution to the building load is 80 percent. Design monthly building heating loads for the entire area, including the greenhouse, are approximately 11,000 Btu per heating degree-day.

II. PERFORMANCE EVALUATION

A. Introduction

During June weather conditions were such that some form of overheating protection or cooling was required for the majority of the month. Sunlight was abundant, with many clear sunny days observed. Outside ambient air temperatures were frequently near 90°F during the sunny daytime hours. Average building temperatures were maintained at comfortable levels, only occasionally exceeding 80°F. Protection against overheating was accomplished by shading of the greenhouse glazing and through use of venting of the system. Operation of the greenhouse to rock storage fans also provided some cooling during the month. Interior relative humidity levels were low over the entire month.

B. Weather

The daily average incident solar energy on the greenhouse glazing was 1,507 Btu/ft^2-day, which was well above the long-term average of 1,295 Btu/ft^2-day derived from measurements at the Phoenix, Arizona weather bureau. The average outside ambient temperature was 68°F, slightly cooler than the long-term May average value for Prescott of 69°F. Daily average outside ambient temperatures varied from a low of 55°F on June 2 to a high of 79°F on June 30.

C. System Thermal Performance

The passive solar space heating system was operated in a warm weather mode over the entire month of June. The redwood snow fence was in place over the greenhouse glazing during the entire month. Venting of the house and greenhouse was also used to prevent overheating of the conditioned space.

Since the system was operated in a warm weather mode, the performance analysis for June will continue to address the warm weather operation concern for a passive system - potential conditioned space overheating. Temperatures inside the building were maintained at reasonably comfortable levels during the majority of the month. Late afternoon building temperatures occasionally exceeded 80°F. These higher temperatures were generally due to direct heating from the greenhouse as the sliding glass doors between the house and greenhouse areas were opened. Also contributing to the higher afternoon temperatures was energy admitted through the west facing window in the master bedroom when the window shade was open.

On most days, only small variations in building temperature were observed, even when considerable amounts of solar energy were available. The average difference in daily minimum and maximum building temperatures was 5°F. Building temperatures never dropped below 70°F, even with nighttime venting. Occasionally, building temperatures late at night were warmer than daytime building temperatures. This is due to the lack of venting during those nights and the resultant energy release from storage.

D. Observations

Several changes to the numbers in the attached computer printout are made for warm weather reporting of passive systems. The building is assumed to not have a heating load. Consequently the values of the heating load are set to zero. The performance factors relating to energy collection do not apply for the warm weather periods since the task for a passive system in warm weather is energy rejection as opposed to energy collection.

During winter months a problem with high interior relative humidity has been encountered. In the past, increases in interior relative humidity were found to correlate with operation of the greenhouse to rock bed fans. During June the fans continued to be used. However, considerable increases in interior relative humidity were observed only on several days. These increases in interior relative humidity were again found to correlate with periods of time when the sliding glass doors between the house and greenhouse were open.

During June the greenhouse to rock storage fans were enabled in their normal winter mode of operation, transferring energy from the greenhouse area to the rock bed under the north side of the building. This fan operation, which began on June 13, is apparent in the increase in the daily average temperatures of the rocks. For several days, the operation of the fans caused cooling of the building as shown in Figure 2 since the air exiting the rock bed was considerably cooler than the room temperatures. However, by the end of the month, the rock temperatures were high enough that this cooling effect was no longer possible.

Since there are no air entry vents in the greenhouse area, air for ventilation of the greenhouse must enter through the building before exiting at the powered fan at the top of the greenhouse. During the time period from June 17 through June 20, cool air entered through open windows of the north side of the building and passed through the rocks before exiting at the greenhouse, causing the reduction observed in the rock average storage temperature.

E. Energy Savings

An energy penalty of 0.27 million Btu (80 kwh) of electrical energy was incurred due to operation of the greenhouse to rock storage fans.

III. ACTION STATUS

One air flow sensor remains inoperative, but the missing data does not alter computed system performance. The instrumentation of the wood stove

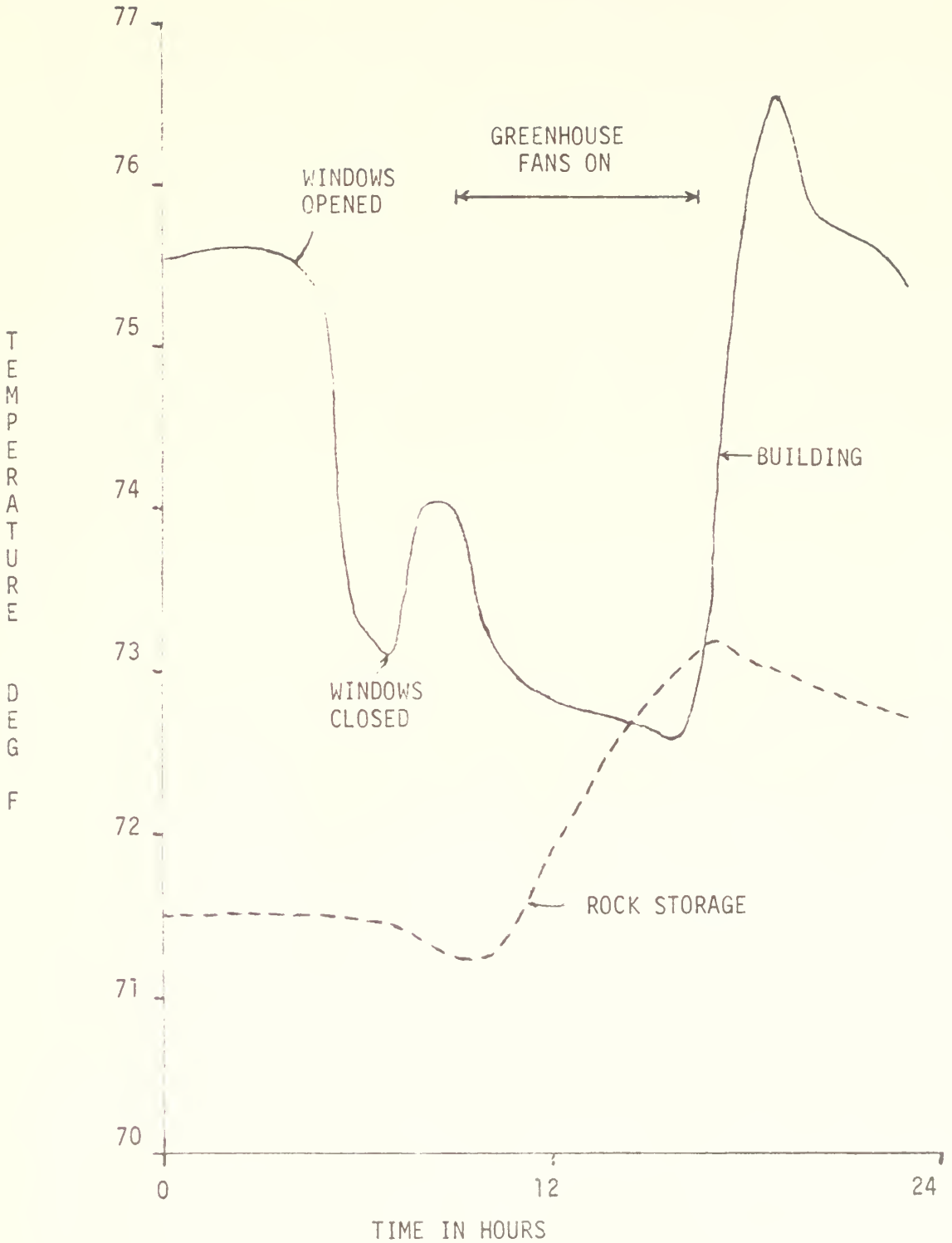


Figure 2. BUILDING AND STORAGE TEMPERATURE - JUNE 14

operation is being changed from a thermal switch to a stove surface temperature measurement in order to quantify both the heating rate of the wood stove and the effect of the stove on comfort.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HULLCO
REPORT PERIOD: JUNE, 1979

SOLAR/1043-79/06

SITE/SYSTEM DESCRIPTION:
THE HULLCO SITE IS A PASSIVELY HEATED SINGLE FAMILY DWELLING WITH 1056 SQ. FT. OF FLOOR SPACE. THE STRUCTURAL ENVELOPE OPENS TO THE SOUTH WHERE A GREENHOUSE TRAPS HEAT. HEAT LOSSES FROM THE HOUSE ARE REDUCED BY USING HEAVY INSULATION IN THE CEILING AND REDUCING GLASS AREAS ON NORTH, EAST, AND WEST FACADES. ENERGY IS STORED IN THE CONCRETE FLOOR OF THE HOUSE AND THE MASSIVE INTERNAL WALLS. ADDITIONAL STORAGE IS PROVIDED BY TWO ROCK BEDS UNDER THE NORTH END OF THE BUILDING CHARGED BY FORCED AIR FROM THE GREENHOUSE.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	18.082 MILLION BTU
	45204 BTU/SQ.FT.
COLLECTED SOLAR ENERGY	N.A. MILLION BTU
	N.A. BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	68 DEGREES F
AVERAGE BUILDING TEMPERATURE	74 DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.00
ECSS OPERATING ENERGY	0.272 MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.272 MILLION BTU
TOTAL ENERGY CONSUMED	0.281 MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	N.A.	0.000	N.A.	0.000 MILLION BTU
SOLAR FRACTION	N.A.	0	N.A.	0 PERCENT
SOLAR ENERGY USED	N.A.	0.000	N.A.	0.000 MILLION BTU
OPERATING ENERGY	N.A.	N.A.	N.A.	0.272 MILLION BTU
AUX. THERMAL ENERGY	N.A.	0.004	N.A.	0.004 MILLION BTU
AUX. ELECTRIC FUEL	N.A.	0.004	N.A.	0.004 MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. MILLION BTU
ELECTRICAL SAVINGS	N.A.	-0.272	N.A.	-0.272 MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.000

* DENOTES UNAVAILABLE DATA
â DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HULLCC
REPORT PERIOD: JUNE,1979

SOLAR/1043-79/06

SITE/SYSTEM DESCRIPTION:
THE HULLCC SITE IS A PASSIVELY HEATED SINGLE FAMILY DWELLING WITH 1056 SQ. FT. OF FLOOR SPACE. THE STRUCTURAL ENVELOPE OPENS TO THE SOUTH WHERE A GREENHOUSE TRAPS HEAT. HEAT LOSSES FROM THE HOUSE ARE REDUCED BY USING HEAVY INSULATION IN THE CEILING AND REDUCING GLASS AREAS ON NORTH, EAST, AND WEST FACADES. ENERGY IS STORED IN THE CONCRETE FLOOR OF THE HOUSE AND THE MASSIVE INTERNAL WALLS. ADDITIONAL STORAGE IS PROVIDED BY TWO ROCK BEDS UNDER THE NORTH END OF THE BUILDING CHARGED BY FORCED AIR FROM THE GREENHOUSE.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	19.076 GIGA JOULES
	513338 KJ/SQ.M.
COLLECTED SOLAR ENERGY	N.A. GIGA JOULES
	N.A. KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	20 DEGREES C
AVERAGE BUILDING TEMPERATURE	24 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.00
ECSS OPERATING ENERGY	0.287 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.287 GIGA JOULES
TOTAL ENERGY CONSUMED	0.297 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	N.A.	0.000	N.A.	0.000 GIGA JOULES
SOLAR FRACTION	N.A.	0	N.A.	0 PERCENT
SOLAR ENERGY USED	N.A.	0.000	N.A.	0.000 GIGA JOULES
OPERATING ENERGY	N.A.	N.A.	N.A.	0.287 GIGA JOULES
AUX. THERMAL ENG	N.A.	0.005	N.A.	0.005 GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	0.005	N.A.	0.005 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
ELECTRICAL SAVINGS	N.A.	-0.287	N.A.	-0.287 GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.000

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: HULLCO
REPORT PERIOD: JUNE,1979

SOLAR/1043-79/06

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.000	0	0.000	NOT APPLICABLE	0.000	0.000	NOT APPLICABLE	0.000	NOT APPLICABLE	72	59
2	0.000	0	0.000		0.002	0.002		0.000		73	55
3	0.000	0	0.000		0.000	0.000		0.000		73	61
4	0.000	0	0.000		0.002	0.002		0.000		73	59
5	0.000	0	0.000		0.000	0.000		0.000		74	65
6	0.000	0	0.000		0.000	0.000		0.000		76	71
7	0.000	0	0.000		0.000	0.000		0.000		75	67
8	0.000	0	0.000		0.000	0.000		0.000		73	58
9	0.000	0	0.000		0.000	0.000		0.000		72	58
10	0.000	0	0.000		0.000	0.000		0.000		74	66
11	0.000	0	0.000		0.000	0.000		0.000		77	70
12	0.000	0	0.000		0.000	0.000		0.000		79	72
13	0.000	0	0.000		0.000	0.000		-0.028		78	72
14	0.000	0	0.000		0.000	0.000		-0.017		74	75
15	0.000	0	0.000		0.000	0.000		-0.019		72	72
16	0.000	0	0.000		0.000	0.000		-0.018		72	68
17	0.000	0	0.000		0.000	0.000		-0.003		74	64
18	0.000	0	0.000		0.000	0.000		0.000		72	59
19	0.000	0	0.000		0.000	0.000		0.000		73	60
20	0.000	0	0.000		0.000	0.000		-0.008		74	64
21	0.000	0	0.000		0.000	0.000		-0.011		74	67
22	0.000	0	0.000		0.000	0.000		-0.010		74	68
23	0.000	0	0.000		0.000	0.000		-0.016		74	69
24	0.000	0	0.000		0.000	0.000		-0.016		74	72
25	0.000	0	0.000		0.000	0.000		-0.011		76	74
26	0.000	0	0.000		0.000	0.000		-0.016		76	77
27	0.000	0	0.000		0.000	0.000		-0.025		75	77
28	0.000	0	0.000		0.000	0.000		-0.024		76	78
29	0.000	0	0.000		0.000	0.000		-0.033		77	76
30	0.000	0	0.000		0.000	0.000		-0.018		78	79
SUM	0.000	-	0.000	N.A.	0.004	0.004	N.A.	-0.272	N.A.	-	-
AVG	0.000	0	0.000	N.A.	0.000	0.000	N.A.	-0.009	N.A.	74	68
NBS	Q402	N400	Q4CC	Q403	Q4C1		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: HULLCO
REPORT PERIOD: JUNE,1979

SOLAR/1043-79/06

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	901	N	59	73	50	0	2
2	518	O	55	66	74	79	3
3	1358	T	61	75	50	331	2
4	1143		59	69	67	60	2
5	1411	A	65	79	55	265	3
6	1642	P	71	79	32	271	7
7	1679	P	67	75	33	288	8
8	1614	L	58	66	38	131	4
9	1497	I	58	*	23	83	4
10	1678	C	66	78	20	27	3
11	1690	A	70	84	32	0	2
12	1600	B	72	89	28	0	1
13	1638	L	72	90	20	299	3
14	1413	E	75	88	22	261	5
15	1681		72	86	15	260	6
16	1718		68	79	4	283	6
17	1694		64	72	9	288	10
18	1673		59	67	19	267	8
19	1722		60	74	18	260	2
20	1665		64	81	16	294	3
21	1628		67	85	16	265	3
22	1672		68	85	17	263	2
23	1644		69	86	14	254	2
24	1666		72	89	13	261	2
25	1631		74	91	14	260	4
26	1628		77	95	14	246	3
27	1615		77	96	10	220	3
28	1575		78	96	13	202	2
29	773		76	87	18	0	2
30	1436		79	90	22	254	5
SUM	45204	N.A.	-	-	-	-	-
AVG	1507	N.A.	68	82	26	277	4
NBS ID	Q001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
PASSIVE SPACE HEATING

SITE: HULLCO
REPORT PERIOD: JUNE, 1979

SOLAR/1043-79/06

DAY OF MON	SPACE HEATING LOAD MILLION BTU	SOLAR ENERGY USED MILLION BTU	CHANGE IN STORE ENERGY MILLION BTU	AVERAGE STORAGE TEMP DEG F	DIRECT SOLAR UTIL EFFIC	AUX THERMAL USED MILLION BTU	BLDG TEMP DEG F	AMB TEMP DEG F	WIND AVG SPEED MPH	WIND AVG DIR DEG	SOLAR LOAD PER CENT
1	0.000	0.000	-0.024	68.2	0.000	0.000	72	59	1.8	0	0
2	0.000	0.000	-0.027	67.4	0.000	0.001	73	55	3.0	79	0
3	0.000	0.000	0.045	67.9	0.000	0.000	73	61	2.3	331	0
4	0.000	0.000	-0.001	68.3	0.000	0.002	73	59	2.4	60	0
5	0.000	0.000	0.056	68.7	0.000	0.000	74	65	3.1	265	0
6	0.000	0.000	0.059	69.8	0.000	0.000	76	71	6.7	271	0
7	0.000	0.000	0.017	70.2	0.000	0.000	75	67	8.2	288	0
8	0.000	0.000	-0.074	69.8	0.000	0.000	73	58	4.2	131	0
9	0.000	0.000	-0.019	68.8	0.000	0.000	72	58	3.6	83	0
10	0.000	0.000	0.050	69.1	0.000	0.000	74	66	2.9	27	0
11	0.000	0.000	0.072	70.4	0.000	0.000	77	70	1.6	0	0
12	0.000	0.000	0.062	71.7	0.000	0.000	79	72	1.3	0	0
13	0.000	0.000	0.046	72.1	0.000	0.000	78	72	2.6	299	0
14	0.000	0.000	0.053	72.6	0.000	0.000	74	75	5.0	261	0
15	0.000	0.000	-0.002	72.4	0.000	0.000	72	72	6.4	260	0
16	0.000	0.000	-0.038	72.2	0.000	0.000	72	68	6.0	283	0
17	0.000	0.000	-0.049	71.7	0.000	0.000	74	64	10.0	288	0
18	0.000	0.000	-0.083	70.7	0.000	0.000	72	59	7.6	267	0
19	0.000	0.000	-0.012	69.9	0.000	0.000	73	60	2.3	260	0
20	0.000	0.000	0.022	70.3	0.000	0.000	74	64	2.7	294	0
21	0.000	0.000	0.059	71.0	0.000	0.000	74	67	3.1	265	0
22	0.000	0.000	0.035	71.7	0.000	0.000	74	68	2.3	263	0
23	0.000	0.000	-0.006	72.1	0.000	0.000	74	69	2.2	254	0
24	0.000	0.000	0.055	72.3	0.000	0.000	74	72	2.4	261	0
25	0.000	0.000	0.042	73.1	0.000	0.000	76	74	3.6	260	0
26	0.000	0.000	0.057	73.8	0.000	0.000	76	77	3.1	246	0
27	0.000	0.000	0.120	74.8	0.000	0.000	75	77	2.8	220	0
28	0.000	0.000	0.080	76.0	0.000	0.000	76	78	2.2	202	0
29	0.000	0.000	-0.030	76.1	0.000	0.000	77	76	2.0	0	0
30	0.000	0.000	0.022	76.3	0.000	0.000	78	79	4.9	254	0
SUM	0.000	0.000	0.588	-	-	0.004	-	-	-	-	-
AVG	0.000	0.000	0.019	71.3	0.000	0.000	74	68	3.7	277	0
NBS	Q402	Q400	Q202			Q401	N405	N113	N114	N115	N400

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
PASSIVE SYSTEM ENVIRONMENT

SITE: HULLCO
REPORT PERIOD: JUNE, 1979

SOLAR/1043-79/06

DAY OF MON	BUILDING COMFORT ZONE 1	BLDG COMF ZONE 2	BUILDING TEMP MIDNIGHT DEG F	BUILDING TEMP 6 AM DEG F	BUILDING TEMP NOON DEG F	BUILDING TEMP 6 PM DEG F	INTERIOR RELATIVE HUMIDITY PERCENT	AMB TEMP DEG F	DAYTIME AMB TEMP DEG F	INCIDENT SOLAR ENERGY MILLION BTU	AVG STOR TEMP DEG F
1	72	71	73	72	72	73	28	59	73	0.360	68
2	72	71	72	71	71	74	31	55	66	0.207	67
3	73	72	76	73	73	75	30	61	75	0.543	68
4	72	72	73	72	73	73	32	59	69	0.457	68
5	73	73	73	72	73	75	34	65	79	0.564	69
6	74	74	75	73	75	80	32	71	79	0.657	70
7	74	74	76	74	74	75	29	67	75	0.672	70
8	72	71	75	74	73	72	26	58	66	0.645	70
9	72	71	72	71	70	73	21	58	*	0.599	69
10	73	73	73	71	73	78	21	66	78	0.671	69
11	75	76	75	73	77	81	24	70	84	0.676	70
12	77	78	78	75	79	84	24	72	89	0.640	72
13	77	76	80	75	78	79	28	72	90	0.655	72
14	74	73	76	75	73	75	31	75	88	0.565	73
15	73	70	75	71	71	71	30	72	86	0.672	72
16	73	71	74	70	72	71	28	68	79	0.687	72
17	74	73	74	73	72	75	25	64	72	0.678	72
18	73	71	74	73	70	73	20	59	67	0.669	71
19	73	72	72	71	71	76	20	60	74	0.689	70
20	73	73	75	73	75	73	23	64	81	0.666	70
21	73	72	74	73	76	72	28	67	85	0.651	71
22	74	73	75	73	76	75	30	68	85	0.669	72
23	74	73	76	74	75	73	28	69	86	0.657	72
24	74	73	75	74	74	72	24	72	89	0.666	72
25	75	75	75	75	81	75	24	74	91	0.653	73
26	76	75	77	73	82	74	25	77	95	0.651	74
27	75	74	76	76	73	75	27	77	96	0.646	75
28	76	75	76	76	75	76	28	78	96	0.630	76
29	77	76	78	75	76	78	29	76	87	0.309	76
30	77	77	78	76	77	79	31	79	90	0.574	76
SUM	-	-	-	-	-	-	-	-	-	18.082	-
AVG	74	73	75	73	74	75	27	68	82	0.603	71
NBS								N113			

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOLLOC SITE SPECIAL REPORT

SITE: HOLLOC
SOLAR/1043-79/06
REPORT PERIOD: JUNE,1979

DAY OF MON	STORAGE AVG TEMP DEG F	ROCK STOR AVG TEMP DEG F	TROMBE WALL AVG TEMP DEG F	DIRECT GAIN FLOOR AVG TEMP DEG F
1	68	67	71	69
2	67	67	69	68
3	68	67	70	69
4	68	67	71	69
5	69	67	72	69
6	70	68	73	70
7	70	69	73	70
8	70	69	73	70
9	69	68	71	70
10	69	68	72	70
11	70	69	74	70
12	72	69	76	71
13	72	70	76	72
14	73	72	76	72
15	72	73	75	72
16	72	73	74	72
17	72	72	74	71
18	71	71	73	71
19	70	69	72	71
20	70	69	73	71
21	71	70	74	71
22	72	71	75	72
23	72	71	76	72
24	72	71	76	72
25	73	72	77	73
26	74	73	78	73
27	75	75	78	74
28	76	77	79	74
29	76	78	78	74
30	76	78	79	74
SUM	-	-	-	-
AVG	71	71	74	71
MES				

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

UNIVERSITY OF FLORIDA
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